

Cluster planting of mangroves along Sungai Garama, Beaufort, Sabah, Malaysia

Background

A cluster planting trial was carried out along Sungai Garama of the Padas Damit Forest Reserve, Beaufort, Sabah (Fig. 1). The river systems of Sg. Garama and Sg. Klias are known to be important habitats of the proboscis monkeys and fireflies on the west coast of Sabah. The area selected for planting is degraded, prone to periodic fire outbreaks, and densely infested with the fern of *Acrostichum aureum* and grass of *Scleria sumatrensis*. The objective of this trial is to test the feasibility of cluster planting of large seedlings as a silvicultural technique and to identify suitable species for rehabilitation. The concept of cluster planting is to establish mother populations of mangroves, which can serve as seed sources to progressively regenerate the degraded area.

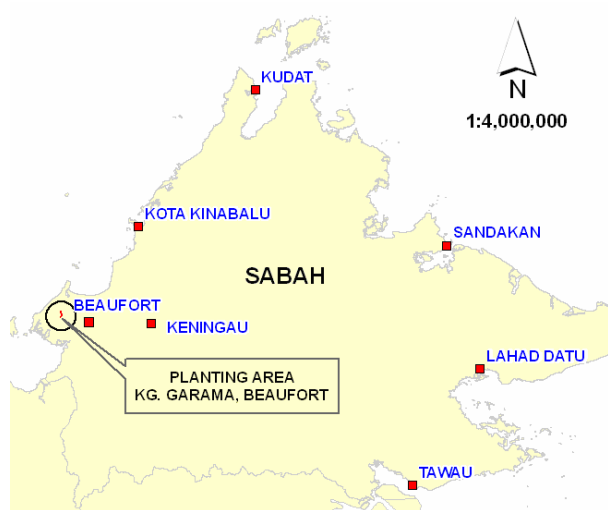


Fig. 1. Location of Sungai Garama in Sabah

Materials and methods

Five sites (A1-A5) of one hectare each were planted in April 2012 with *Avicennia alba*, *Ceriops tagal* and *Xylocarpus granatum* (true mangroves), and *Aglaia cucullata* (mangrove associate). Located 50-100 m from the bank of Sg. Garama (Fig. 2), each site was planted with 10 random clusters (each 10 x 10 m in area and 10-20 m apart). Each cluster comprised eight

seedlings, more than 12 months old and about a metre in height. The seedlings were sourced from nurseries at Sg. Sibyte and Sg. Garama. The use of large seedlings was aimed at overcoming crab infestation, a problem encountered in an earlier planting trial of propagules.

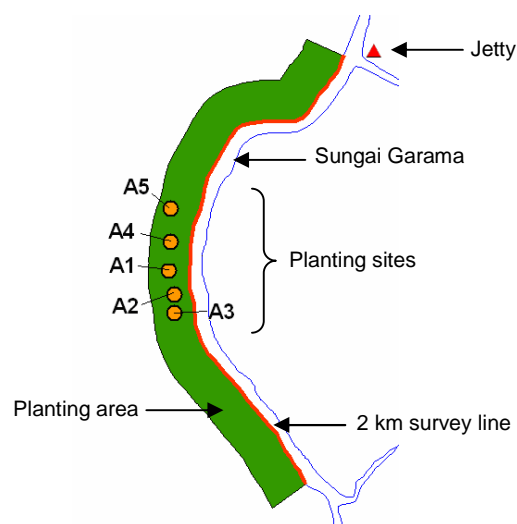


Fig. 2. Planting sites along Sungai Garama

Results and discussion

The survival percentage of planted species was assessed in May, June and July 2012 (Fig. 3). After three months, *A. alba* had the highest survival of >99% while *C. tagal* had the lowest survival of >88%. It can be inferred that *A. alba*, *A. cucullata* and *X. granatum* with survival >92% are suitable species for rehabilitation of the degraded mangrove area along Sg. Garama. Between planting sites, survival of *A. alba* and *A. cucullata* (Fig. 4) was 100% after three months in A1-A4 (Fig. 5). Survival of *X. granatum* and *C. tagal* was $\geq 90\%$ and $\geq 70\%$, respectively.

Along the 100 m wide riparian belt, most of the mangrove species survived the first three months. Further inland, planting of mangrove species would be difficult as the site is no longer inundated by tides and the substrate is that of fresh water swamps. It is evident that future planting efforts should be confined to the riparian belt with focus on mangrove species that can serve as habitat and forage for the proboscis monkeys and fireflies.

Acknowledgements

The authors wish to thank Datuk Sam Mannan (Director), Mr. Fidelis Edwin Bajau, (Deputy Director of Development) and Mr. Frederick Kugan (Deputy Director of Forest Sector Planning) of the Forestry Department of Sabah for their support. This study forms part of the SFD-ISME Collaborative Project on Rehabilitation of Degraded Mangroves in Sabah. The financial support of Tokio Marine and Nichido Fire Insurance Co. Ltd., Japan, and the field work by Research Assistants, i.e. Soinin Satman, Jamiss Aribin, Dauni Seligi and Fabian Koret, are gratefully acknowledged.

¹Joseph Tangah, ²Shigeyuki Baba & ²H.T. Chan

¹ Forest Research Centre, Sabah Forestry Department, Sandakan, Sabah, Malaysia
E-mail: Joseph.Tangah@sabah.gov.my

² International Society for Mangrove Ecosystems, University of the Ryukyus, Okinawa, Japan

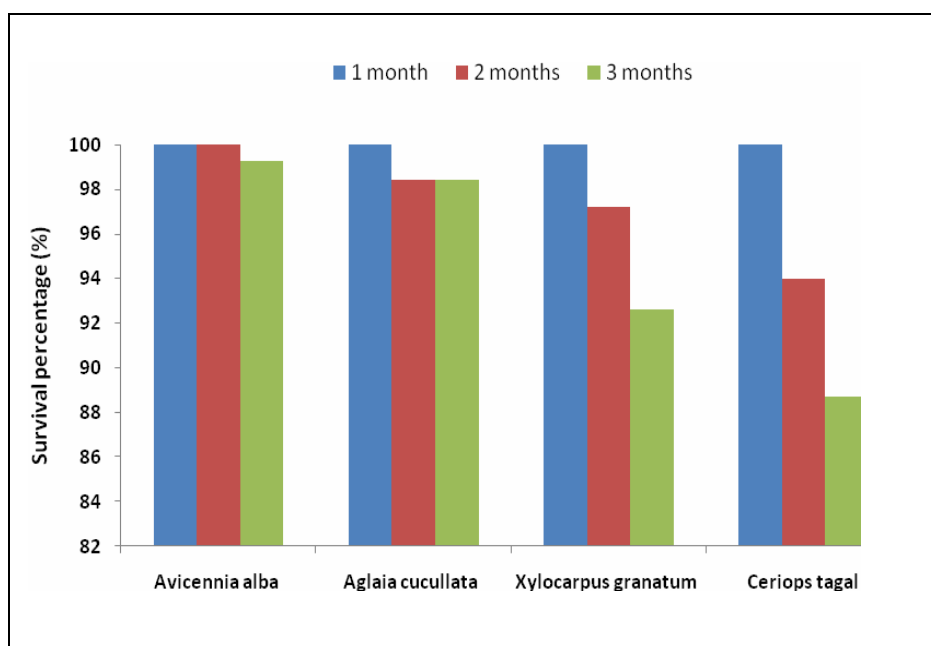


Fig. 3. Survival percentage of mangrove species



Photo by J. Tangah



Photo by J. Tangah

Fig. 4. Seedlings of *Avicennia alba* (left) and *Aglaia cucullata* (right) three months after planting

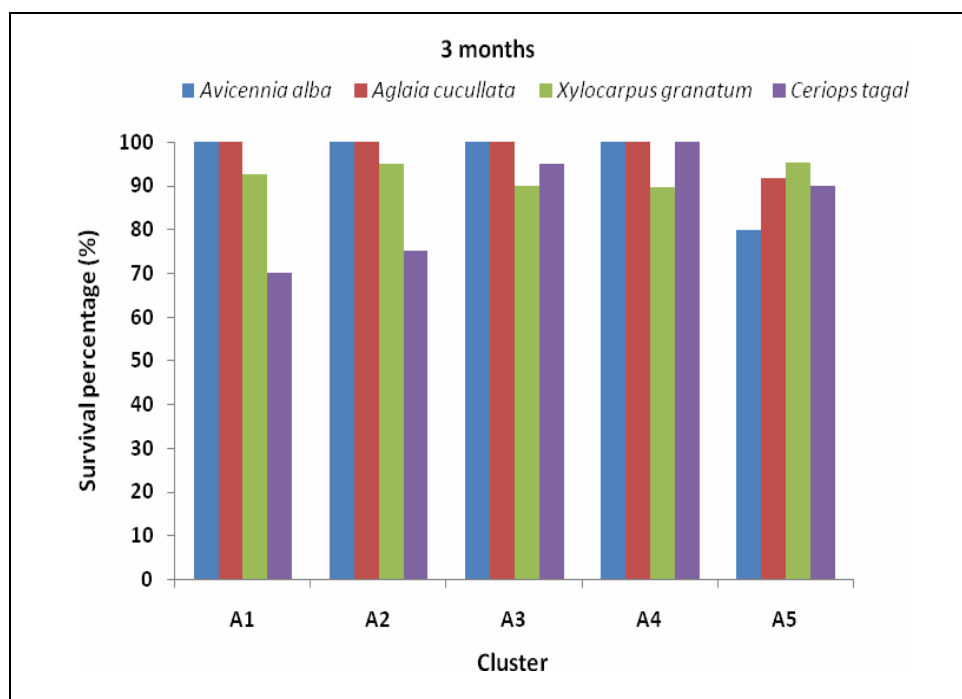


Fig. 5. Survival percentage of mangrove species between planting sites